

## CROSS-REFERENCE TO RELATED APPLICATIONS

References Cited			
U.S. Patent Documents			
4786783	Nov., 1988	Woodard; Floyd E.	219/547
6155061	Dec., 2000	Davis, Jr., et al.	62/176.6
6598653	Jul., 2003	Gonzalez	160/370.21
6668917	Dec., 2003	Zeng; Xin	165/202

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

[1] The present invention is directed to devices designed to accomplish the following:

- To prevent fogging of the automobile windshield.
- To enhance thawing of ice accumulated on the automobile windshield.
- To reduce fogging of the automobile front side windows.

### 2. Prior Art

[2] Fogging is caused by condensed water vapor collecting on a glass surface due to the difference in temperature between the glass surface and the adjacent air. Warmer air inside an automobile in contact with the windshield and side window surfaces will be cooled down, the cooling of this air reduces its ability to retain moisture, and thus the moisture that is released condenses on the inside of the windshield and side window surfaces. There are two different climate conditions in which fogging of the windshield and side windows occur even though the automobile has a ventilation system. First, in a cold climate, it occurs when the temperature inside the automobile differs significantly from the temperature outside. Secondly, in a wet climate such as a rainy day, it occurs when

humidity inside the automobile is very high and the rain and wind keep the windshield and side windows cooler than air inside the automobile. When fogging of the windshield and side windows occurs, it significantly reduces the driver's visibility through the windshield and front side windows, greatly increasing the risk of traffic accidents. To address this issue, US patent 4786783 provides an electrically heated laminated windshield, and US patent 6668917 and 6155061 provide advanced HVAC systems. For average automobiles, the electrically heated laminated windshield is very expensive to produce, maintain and operate. The advanced HVAC systems that reduce fogging of the windshield are also too expensive for average automobiles.

- [3] Also, in a cold climate, an automobile cannot be operated until ice accumulated on the windshield is melted and removed. To melt the ice, the time to preheat the automobile passenger compartment may be significant. To address this issue, US patent 6598653 provides a windshield cover to prevent ice accumulating. However, the windshield cover is easily stolen. Also, after its use, an iced windshield cover may not be stored right way.
- [4] Currently, there is not a simple, economic approach that can effectively address the safety concerns related to fogging of the windshield and front side windows in a wet or cold climate. Also, there is not a simple, economic and effective way to quickly melt ice accumulated on the windshield in a cold climate. Therefore, it is the objective of the present invention to create a simple and economic solution to address the above issues effectively so that the automobile industry will adapt the solution and make driving safer and easier in a wet or cold climate. The characteristics of the present invention will become apparent in light of the present specification, including claims, and drawings.

#### BRIEF SUMMARY OF THE INVENTION

- [5] It is an objective of this invention to prevent fogging of the windshield in a wet or cold climate and thereby improve driving safety.
- [6] Another objective of this invention is to speed up the melting of ice accumulated on the windshield in a cold climate so that an automobile can be operated soon after its engine warmed up.
- [7] Still another objective of this invention is to reduce fogging of the front side windows in a wet or cold climate to enhance driving safety.

- [8] According to this invention, the windshield heating air appliance is made of transparent materials such as plastic as figure 1 illustrates. The dashboard windshield air vent cover (6) and flexible heated air supply male connector (1A) shown in Figure 4 are made of plastic. The windshield, and windshield heating air appliance together form a complete assembly henceforth referred as the controlled windshield heating air space that is shown in Figure 3. The controlled windshield heating air space can be quickly heated up through the heated air supply, the internal windshield surface can be maintained at an optimal temperature to prevent fogging of the windshield in a wet or cold climate, reducing the time required to melt the ice accumulated on the windshield in a cold climate.
- [9] According to this invention, the front side window cover is made of transparent materials such as plastic as Figure 10 and Figure 11 illustrate. Since air is a poor thermal conductor, an additional insulation layer, formed by the front side window cover and air inside of the front side window cover, keeps the front side window cover temperature close to the internal automobile passenger compartment temperature. This effectively reduces fogging of the front side windows in a wet or cold climate.
- [10] This invention has the following major advantages:
- It provides a single solution to address multiple issues, which include preventing fogging of the windshield, and reducing the time to melt ice accumulated on the windshield.
  - The windshield heating air appliance and front side window covers are inexpensive.
  - It does not occupy automobile passenger compartment usable room.
  - Its installation is simple and easy.
  - It reduces fogging of the front side windows.

#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

- [11] The foregoing summary and the following detailed description may be better understood when read in conjunction with the accompanying drawings. Various embodiments are shown for the purpose of illustrating the invention. It is understood, however, that this invention is not limited to the precise implementation shown.

- [12] Figure 1 shows an external view of the windshield heating air appliance with a heated air supply female connector (1) and a rear view mirror base path (2); its edges (3) are designed to be attached to the windshield surface.
- [13] Figure 2 shows a passenger side view of the windshield heating air appliance.
- [14] Figure 3 shows the windshield represented by thin dashed lines (4), and the windshield heating air appliance together form the controlled windshield heating air space, which is less than 1% of the entire automobile passenger compartment.
- [15] Figure 4 shows an external view of the dashboard windshield air vent cover (6) with a flexible heated air supply male connector (1A). This male connector joins the heated air supply female connector (1) of the windshield heating air appliance to supply heated air for the controlled windshield heating air space. Automobile dashboard windshield air vent (5) may be different in shape or location on its dashboard (7), so may the related dashboard windshield air vent cover (6) be different.
- [16] Figure 5 shows an external view of the dashboard (7) equipped with a separate windshield heated air supply outlet (8) that replaces the existing dashboard windshield air vent (5).
- [17] Figure 6 shows an external view of the separate dashboard windshield heated air supply outlet (8) fixed with a flexible heated air supply male connector (1B). This male connector joins the heated air supply female connector (1) of the windshield heating air appliance to supply heated air for the controlled windshield heating air space.
- [18] Figure 7 shows a windshield heating air appliance edge design; a partial edge of the windshield heating air appliance, the male buttons (10) are attached to the windshield surface, and female buttons (9) are part of the windshield heating air appliance edge.
- [19] Figure 8 shows the partial windshield heating air appliance edge attached to the windshield by locking its female buttons (9) with male buttons (10) that are fixed to the windshield surface. The foam layer (11) seals the gap between the windshield heating air appliance edge and the windshield surface.
- [20] Figure 9 shows a view of the windshield heating air appliance comprised of two symmetric parts to facilitate shipping.
- [21] Figure 10 shows a view of the front side window cover.
- [22] Figure 11 shows an isometric view of the front side window cover.
- [23] Figure 12 shows edge sizes of the front side window cover.

## DETAILED DESCRIPTION OF THE INVENTION

- [24] According to this invention, the windshield heating air appliance is made of transparent materials such as plastic that are unbreakable during an automobile crash; the windshield heating air appliance edges are designed to be attached to the windshield by locking its windshield edge female buttons (9) with male buttons (10) that are fixed to the windshield surface. The windshield, and windshield heating air appliance together form a complete assembly henceforth referred as the controlled windshield heating air space. Using heated air supply from either dashboard windshield air vent (5) or a separate windshield heated air supply outlet (8), the controlled windshield heating air space can be quickly heated up, and the internal windshield surface can be maintained at an optimal temperature; thus the heated internal windshield surface no longer allows the adjacent air to transfer moisture, which prevents fogging of windshield. This ensures the best driving visibility in a wet or cold climate.
- [25] Furthermore, the controlled windshield heating air space can maintain the windshield surface at a relatively high temperature in a very cold climate, this can prevent the windshield from a dangerous "flash freeze" situation which may occur when water at or near freezing point strikes a relatively cool windshield while it is in motion, such as when cold water is splashed up onto a car windshield by a passing tractor-trailer.
- [26] When an automobile is parked in a parking lot or on the street in a cold climate, the normal practice to remove ice accumulated on the windshield is to preheat the automobile passenger compartment. Since the controlled windshield heating air space is less than 1% of an automobile passenger compartment, it takes much less time to heat up the controlled windshield heating air space compared to the entire automobile passenger compartment; thus it takes much a shorter time to heat up the windshield, melt ice accumulated on the windshield, and reduces pollution.
- [27] Some automobiles have the rear view mirror base attached to the ceiling. Others have the rear view mirror base attached to the windshield. To accommodate the need for the rear view mirror base attached to the windshield, the windshield heating air appliance has an open path (2) shown in Figure 1 and Figure 2 to fit the rear view mirror.
- [28] According to this invention, the front side window cover is made of transparent materials such as plastic. Since air is a poor thermal conductor, the air temperature between the front side window and the front side window cover is always higher than the front side

window temperature in a wet or cold climate. An additional insulation layer, formed by the front side window cover and air inside the front side window cover, enhances the front side window insulation, thus keeping the front side window cover temperature close to the inside passenger compartment temperature. This significantly reduces fogging of the front side window in a wet or cold climate.